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FLOOD INSURANCE STUDY

VILLAGE OF HALES CORNERS, WISCONSIN

MILWAUKEE COUNTY

REVISED

JUNE 15, 1988

COMPLETED

Federal Emergency Management Agency

COMMUNITY NUMBER - 550524

FINAL

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

This publication incorporates revisions to the original Flood Insurance Study. These revisions are presented in Section 9.0.

TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
	1.1 Purpose of Study	1
	1.2 Coordination	1
	1.3 Authority and Acknowledgements	1
2.0	AREA STUDIED	2
	2.1 Scope of Study	2
	2.2 Community Description	2
	2.3 Principal Flood Problems	3
	2.4 Flood Protection Measures	3
3.0	ENGINEERING METHODS	4
	3.1 Hydrologic Analyses	4
	3.2 Hydraulic Analyses	5
4.0	FLOOD PLAIN MANAGEMENT APPLICATIONS	6
	4.1 Flood Boundaries	6
	4.2 Floodways	7
5.0	INSURANCE APPLICATION	13
	5.1 Reach Determinations	14
	5.2 Flood Hazard Factors	14
	5.3 Flood Insurance Zones	14
	5.4 Flood Insurance Rate Map Description	15

TABLE OF CONTENTS (continued)

		Page
6.0	OTHER STUDIES	15
7.0	LOCATION OF DATA	17
8.0	REFERENCES AND BIBLIOGRAPHY	17
9.0	REVISIONS DESCRIPTION	18
	9.1 First Revision (Revised June 15, 1988)	18
	a. Acknowledgments	18
	b. Scope	18
	c. Hydrologic and Hydraulic Analyses	18
	d. Floodways	19
	e. Other Studies	20
	f. References and Bibliography	20

FIGURES

Figure 1 -	Vicinity Map	3
Figure 2 -	Floodway Schematic	8

TABLES

Table 1 -	Summary of Discharges	5
Table 2 -	Summary of Elevations	6
Table 3 -	Floodway Data	9
Table 4 -	Flood Insurance Zone Data	16
Table 5 -	Revised Summary of Discharges	19
Table 6 -	Revised Summary of Elevations	19

TABLE OF CONTENTS (continued)

EXHIBITS

			Page #
Exhibit 1 - Flood Profiles			
	Whitnall Park Creek	Panels 01P - 02P	21-22
	Wemp Branch	Panels 03P - 04P	23-24
	113th Street Branch	Panel 05P	25
Exhibit 2 - Flood Boundary and Floodway Map			

PUBLISHED SEPARATELY:

Flood Insurance Rate Map

FLOOD INSURANCE STUDY

VILLAGE OF HALES CORNERS,
MILWAUKEE COUNTY, WISCONSIN

1.0 INTRODUCTION

1.1 Purpose of Study

The purpose of this Flood Insurance Study is to investigate the existence and severity of flood hazards in the Village of Hales Corners, Milwaukee County, Wisconsin, and to aid in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Initial use of this information will be to convert the Village of Hales Corners to the regular program of flood insurance by the Federal Insurance Administration. Further use of the information will be made by local and regional planners in their efforts to promote sound land use and flood plain management.

1.2 Coordination

Representatives of the U.S. Geological Survey (USGS), the Federal Insurance Administration, the Wisconsin Department of Natural Resources, and officials of the Village of Hales Corners selected a community base map, identified the streams requiring detailed study, and determined that the Village of Hales Corners could provide its own large-scale topographic maps at a meeting on February 19, 1975.

The estimates of flood magnitudes were coordinated with and approved by the Wisconsin Department of Natural Resources.

In December 1977, the Wisconsin Department of Natural Resources, the Southeastern Wisconsin Regional Planning Commission, and officials of the Village of Hales Corners reviewed certain flood information, including floodway delineation. At a final coordination meeting on July 12, 1978, personnel of the USGS, the Wisconsin Department of Natural Resources, the Federal Insurance Administration, and officials of the Village of Hales Corners reviewed and accepted the results of work performed by the USGS.

1.3 Authority and Acknowledgements

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968, as amended.

The hydrologic and hydraulic analyses for this study were performed by the U.S. Geological Survey for the Federal Insurance Administration, under

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Inter-Agency Agreement No. IAA-H-8-76, Project Order No. 5. This work, which was completed in August 1977, covered all significant flooding sources affecting the Village of Hales Corners.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Village of Hales Corners. The area of study is shown on the Vicinity Map (Figure 1).

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, areas of projected development and proposed construction until 1982.

Approximate methods of analysis were used to study those areas having low development potential and/or minimal flood hazards as identified at the initiation of the study. The scope and methods of study were proposed to and agreed upon by the Federal Insurance Administration and the community.

The area of detailed study includes the parts of the following streams that are within the corporate limits: Upper Kelly Lake, Root River Tributary from Upper Kelly Lake to Whitnall Park culvert, WEMP Branch from its confluence with Root River Tributary to the western corporate limits, and 113th Street Branch from its confluence with WEMP Branch to West Edgerton Avenue. The Root River Tributary below Whitnall Park was studied by approximate methods.

2.2 Community Description

Hales Corners is a community of approximately three square miles located in west-central Milwaukee County in southeastern Wisconsin. It is bordered by the City of Greenfield on the north, the City of Greendale on the east, the City of Franklin on the south, and Waukesha County on the west. The population of Hales Corners increased 40 percent between 1960 and 1970, from 5,549 to 7,771. The estimated 1976 population is 8,934, an indication of the village's continuing rapid growth.

The climate of Hales Corners is typically continental, with warm summers and cold winters. The average monthly temperatures range from 21 degrees Fahrenheit (F.) in January to 70 degrees F. in July. The average annual precipitation is approximately 30 inches, with approximately 15 percent of that occurring as snow (Reference 1).

Glacial deposits overlying the bedrock formations form the village's irregular land surface, which is characterized by rounded hills or groups of hills, ridges, broad undulating plains, and poorly drained wetlands.

Three intermittent streams run through the village. The largest, Root River Tributary, enters from Upper Kelly Lake and flows primarily southeast through the village to its juncture with another stream, WEMP Branch,

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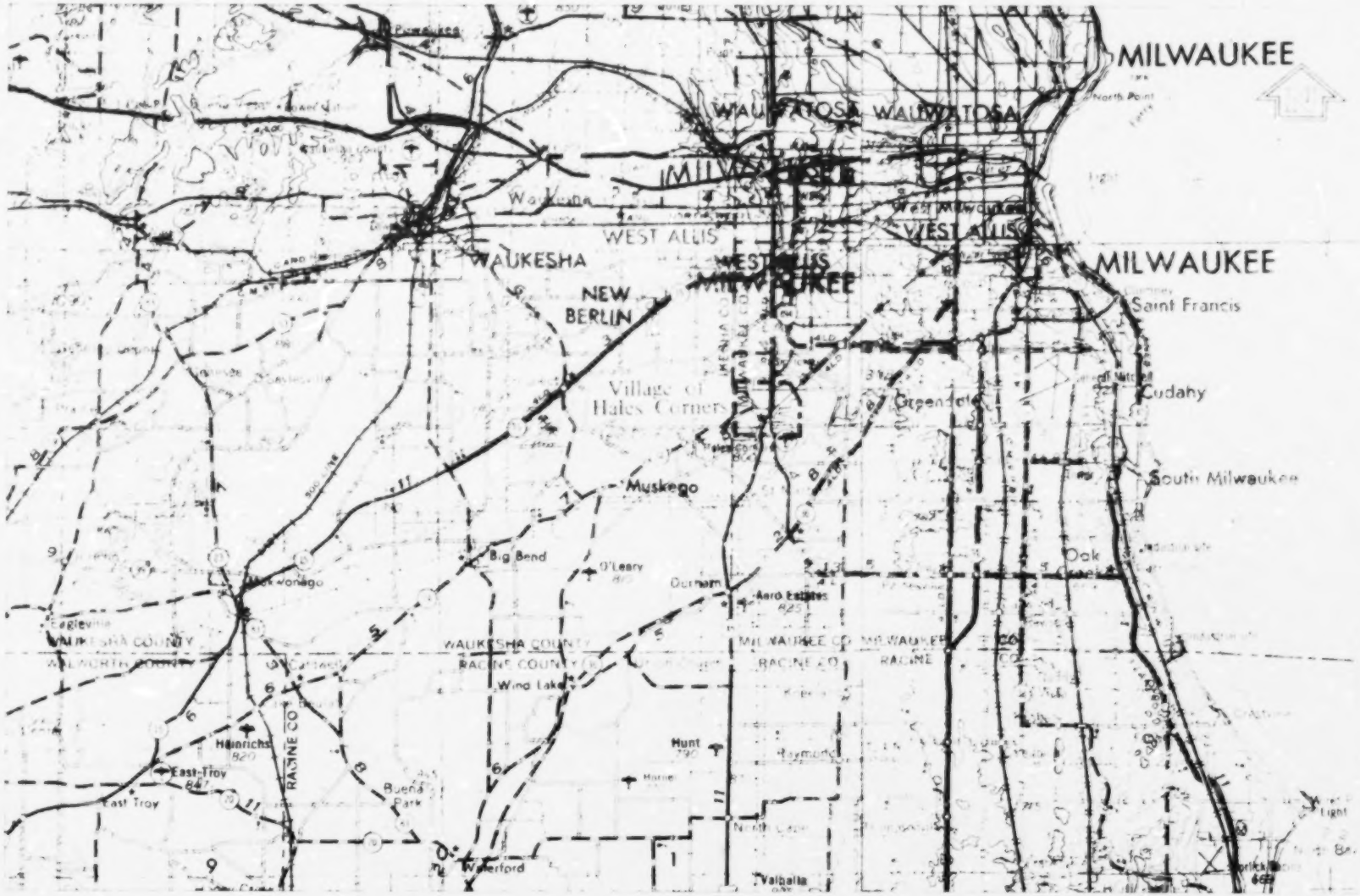

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF HALES CORNERS, WI
(MILWAUKEE CO.)

APPROXIMATE SCALE
4 0 4 8 12 MILES

VICINITY MAP

between Janesville and Forest Home Roads. Root River Tributary then flows east to Whitnall Park and leaves the village at its southeast corner. WEMP Branch enters the village in the northwest corner and flows southeast where it is joined by 113th Street Branch from the north. It then flows south into Root River Tributary. The flood plain in the village is primarily residential, with commercial development concentrated along 108th Street. There are two parks in the village, Whitnall Park in the southeast corner and Hales Corners Park near the western end of the village.

2.3 Principal Flood Problems

Floods in the area are typically caused by melting snow, heavy rainfall, or by a combination of the two factors. The March 1960 flood on the main stem of the Root River was the largest in the last 18 years. This flood, which resulted from fast snowmelt concurrent with heavy spring rains, had a recurrence interval of about 100 years on the Root River. The flood caused some local flooding in Hales Corners and overtopped culverts on West Parnell Avenue and South Kurtz Road.

2.4 Flood Protection Measures

No flood protection measures have been taken in the Village of Hales Corners.

3.0 ENGINEERING METHODS

For flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Floods having recurrence intervals of 10-, 50-, 100-, and 500-years have been selected as having special significance for flood plain management and for flood insurance premium rates. The analyses reported here reflect current conditions in the watersheds of the streams.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each stream studied in detail in the community.

Discharge-frequency values for Root River Tributary, WEMP Branch, and 113th Street Branch were determined using the tabular method of determining peak discharges from the Soil Conservation Service (SCS) Technical Release No. 55 (Reference 2). This method involves developing composite hydrographs utilizing such watershed characteristics as 24-hour rainfall amounts, hydrologic soil-cover complexes, time of concentration, travel time, and drainage area. These peak discharge values compared favorably with those for a nearby gaging station on the Menomonee River in Wauwatosa and to discharge-frequency values at another nearby site determined for a previous study (Reference 3).

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All flood-frequency values for the streams studied in detail were reviewed and approved by the Wisconsin Department of Natural Resources (Reference 4).

Peak discharges for the 10-, 50-, 100-, and 500-year floods of each stream studied in detail in the community are shown in Table 1.

TABLE 1: SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK-DISCHARGE (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
ROOT RIVER TRIBUTARY					
At road crossing in Whitnall Park	4.74	1,000	1,500	1,800	2,300
Just upstream from confluence with WEMP Branch	2.25	370	580	670	970
WEMP BRANCH					
Just upstream from confluence with Root River Tributary	1.25	320	470	540	710
Just upstream from confluence with 113th Street Branch	0.83	210	310	360	470
113TH STREET BRANCH					
Mouth	0.32	130	190	220	280

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the streams in the community are carried out to provide estimates of the elevations of the floods of the selected recurrence intervals along stream studied in detail.

Cross sections for step-backwater analysis for the root River Tributary, Upper Kelly Lake, WEMP Branch, and 113th Street Branch were obtained using large-scale topographic maps for overbank data and field surveys for channel data (Reference 5). Bridges, weirs, and culverts were also field surveyed for the step-backwater analysis.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway is computed (Section 4.2), selected cross section locations are shown on the Flood Boundary and Floodway Map (Exhibit 2).

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Roughness coefficients (Mannings 'n') were assigned based on field inspection of flood plain areas and stream channels. Roughness values for the streams studied in detail range from 0.017 in the concrete-lined channels to 0.045 in natural channels and from 0.020 for parking lots to 0.120 for dense vegetation in the flood plain.

The starting water-surface elevations were determined for Root River Tributary by the slope-area method and for WEMP Branch and 113th Street Branch by a step-backwater analysis from a point downstream. Water-surface profiles for Root River Tributary, WEMP Branch, and 113th Street Branch were developed using the HEC-2 stepbackwater computer model (Reference 6). Elevations for Upper Kelly Lake were determined from weir computations and step-backwater analysis conducted similarly to the riverine methodology. Flood profiles were drawn showing the computed water-surface elevations to an accuracy of 0.5 foot for floods of selected recurrence intervals (Exhibit 1). Flood elevations on Upper Kelly Lake without wave or runup heights for the selected recurrence intervals are shown in Table 2.

TABLE 2: SUMMARY OF ELEVATIONS

	ELEVATIONS (NVGD)			
LOCATION	10-YEAR	50-YEAR	100-YEAR	500-YEAR
UPPER KELLY LAKE	809.0	810.2	811.0	811.9

The hydraulic analyses for this study are based only on the effects of unobstructed flow. The flood elevations as shown on the profiles (Exhibit 1) are, therefore, considered valid only if hydraulic structures, in general, remain unobstructed and if channel and overbank conditions remain essentially the same as ascertained during this study.

All elevations are referenced from National Geodetic Vertical Datum of 1929 (NGVD); elevation reference marks used in the study are shown on the maps.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

A prime purpose of the National Flood Insurance Program is to encourage state and local governments to adopt sound flood plain management programs. Each Flood Insurance Study, therefore, includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the Federal Insurance Administration as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the

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community. For each stream studied in detail, the boundaries of the 100-year and the 500-year floods have been delineated using the elevations determined at each cross section; between cross sections the boundaries were interpolated using using topographic maps at a scale of 1:1200, with a contour interval of two feet (Reference 5). The boundaries of the areas studied by approximate methods were delineated using these maps.

The boundaries of the 100-year and 500-year floods are shown on the Flood Boundary and Floodway Map (Exhibit 2). Small areas within the flood boundaries may lie above the flood elevations, and, therefore, not be subject to flooding; owing to lack of detailed topographical information or to limitations of the map scale, such areas are not shown. In cases where the 100-year and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

Certain areas shown on the Flood Hazard Boundary Map (Reference 7) were determined to be areas of minimal flooding and, as such, have not been included on the Flood Boundary and Floodway Map and the Flood Insurance Rate Map.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity and increases flood heights, thus increasing flood hazard in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent flood plain areas, that must be kept free of encroachment in order that the 100-year flood be carried without substantial increases in flood heights. As minimum standards, the Federal Insurance Administration limits such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. In addition, the Wisconsin Department of Natural Resources is required under Wisconsin Administrative Code Chapter NR 116 (Reference 8) to establish minimum standards for local flood plain zoning ordinances. The Wisconsin Department of Natural Resources has established a policy that limits encroachment in the flood plain to that which will not cause any significant increase in flood heights. Exceptions are possible under special circumstances and with the concurrence of the Minnesota Department of Natural Resources. Thus, a floodway having a zero or a negligible surcharge has been delineated for this study.

The technique used to define the recommended floodway in this report involved describing the sweep and extent of moving floodwater by applying engineering judgment and basic rules of hydraulics to the flooded outline maps. With this technique, the areas in the floodway fringe are areas of ponded water. Only areas with no conveyance (water-carrying ability) are included in the floodway fringe.

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The floodways for most of the streams in Hales Corners do not conform to the 100-year flood limit. Therefore, with few exceptions, both the flood plain and floodway boundary are shown. The results of the floodway computations are shown at cross sections for each stream segment for which a floodway is computed (Table 3). No floodway was computed for Upper Kelly Lake because of its impoundment effect on the 100-year flood.

As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway boundaries were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 0.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

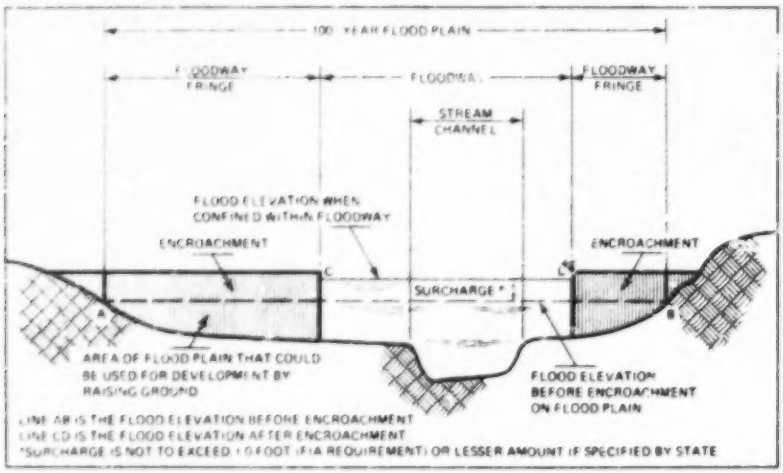
100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
SURCHARGE *
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FIA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

FIGURE 2. Floodway Schematic

The floodways in this report are recommended to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the Federal Insurance Administration has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors, and flood insurance zone designations for each flooding source affecting the Village of Hales Corners.

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ FEET)	MEAN VELOCITY (FEET/SEC)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
113TH STREET BRANCH								
A	0.04	80	54	4.1	785.1	785.1	785.1	0.0
B	0.10	154	115	1.9	786.8	786.8	786.8	0.0
C	0.14	23	52	4.2	787.5	787.5	787.5	0.0
D	0.19	141	239	0.9	788.1	788.1	788.1	0.0
E	0.24	53	61	3.6	788.2	788.2	788.2	0.0
F	0.26	115	154	1.4	789.5	789.5	789.5	0.0
G	0.30	210	182	1.2	789.9	789.9	789.9	0.0
H	0.33	145	147	1.5	789.9	789.9	789.9	0.0
I	0.35	87	119	1.9	790.0	790.0	790.0	0.0
J	0.36	40	43	3.5	790.3	790.3	790.3	0.0
K	0.38	42	58	2.6	790.7	790.7	790.7	0.0
L	0.42	23	42	3.5	791.6	791.6	791.6	0.0
M	0.43	68	109	1.4	793.0	793.0	793.0	0.0
N	0.47	38	58	2.6	793.0	793.0	793.0	0.0
O	0.48	63	78	1.9	793.4	793.4	793.4	0.0
P	0.52	25	45	3.3	793.6	793.6	793.6	0.0
Q	0.53	48	68	1.8	794.9	794.9	794.9	0.0
R	0.55	34	49	2.2	794.9	794.9	794.9	0.0
S	0.60	43	53	2.1	796.4	796.4	796.4	0.0
T	0.61	43	67	1.6	797.0	797.0	797.0	0.0
U	0.65	32	42	2.6	797.3	797.3	797.3	0.0
V	0.66	41	71	1.2	798.3	798.3	798.3	0.0
W	0.68	43	59	1.4	798.6	798.6	798.6	0.0
X	0.70	39	63	1.3	799.3	799.3	799.3	0.0
Y	0.73	44	64	1.3	799.4	799.4	799.4	0.0
Z	0.75	29	50	1.7	799.4	799.4	799.4	0.0
AA	0.78	65	28	2.9	799.8	799.8	799.8	0.0

[1]MILES ABOVE MOUTH

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TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF HALES CORNERS, WI

(MILWAUKEE CO.)

FLOODWAY DATA

113TH STREET BRANCH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
WEMP BRANCH								
AA	0.77	107	162	2.2	791.3	791.3	791.3	0.0
AB	0.81	164	560	0.6	791.5	791.5	791.5	0.0
AC	0.83	136	415	0.9	791.5	791.5	791.5	0.0
AD	0.90	570	1982	0.1	791.5	791.5	791.5	0.0
AE	0.98	425	644	0.3	791.5	791.5	791.5	0.0
AF	1.10	370	488	0.4	791.6	791.6	791.6	0.0
AG	1.16	151	84	2.4	793.5	793.5	793.5	0.0
AH	1.24	80	79	2.5	797.2	797.2	797.2	0.0
AI	1.29	158	77	2.6	800.0	800.0	800.0	0.0
AJ	1.38	68	60	3.3	805.1	805.1	805.1	0.0
AK	1.44	78	51	3.9	809.3	809.3	809.3	0.0
AL	1.51	41	102	2.0	813.8	813.8	813.8	0.0

[1]MILES ABOVE MOUTH
[2]THIS WIDTH EXTENDS BEYOND CORPORATE LIMITS

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TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF HALES CORNERS, WI
(MILWAUKEE CO.)

FLOODWAY DATA

WEMP BRANCH

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
WHITNALL PARK CREEK								
AA	2.70	62	112	4.9	787.4	787.4	787.4	0.0
AB	2.72	23	66	6.8	787.9	787.9	787.9	0.0
AC	2.79	128	131	3.4	790.8	790.8	790.8	0.0
AD	2.86	33	81	4.3	792.4	792.4	792.4	0.0
AE	2.88	48	80	4.3	793.7	793.7	793.7	0.0
AF	2.90	29	71	4.9	794.4	794.4	794.4	0.0
AG	2.93	42	78	4.5	795.3	795.3	795.3	0.0
AH	2.97	34	82	4.2	796.0	796.0	796.0	0.0
AI	3.00	50	79	3.9	796.7	796.7	796.7	0.0
AJ	3.06	34	57	5.4	798.8	798.8	798.8	0.0
AK	3.12	16	56	3.7	800.6	800.6	800.6	0.0
AL	3.14	60	70	3.0	801.6	801.6	801.6	0.0
AM	3.19	39	46	4.6	802.6	802.6	802.6	0.0
AN	3.22	44	45	4.6	804.1	804.1	804.1	0.0
AO	3.27	20	50	4.7	805.6	805.6	805.6	0.0
AP	3.32	11	40	5.8	807.0	807.0	807.0	0.0
AQ	3.34	38	91	2.5	807.7	807.7	807.7	0.0
AR	3.38	68	107	2.2	808.0	808.0	808.0	0.0
AS	3.43	93	151	1.5	808.3	808.3	808.3	0.0
AT	3.45	66	122	1.9	808.4	808.4	808.4	0.0
AU	3.47	11	50	4.6	808.4	808.4	808.4	0.0
AV	3.51	26	81	2.8	809.1	809.1	809.1	0.0
AW	3.53	99	171	1.4	809.2	809.2	809.2	0.0

[1]MILES ABOVE MOUTH

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TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF HALES CORNERS, WI

(MILWAUKEE CO.)

FLOODWAY DATA

WHITNALL PARK CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
WEMP BRANCH								
A	0.04	19	56	3.6	769.1	769.1	769.1	0.0
B	0.05	89	112	4.8	771.7	771.7	771.7	0.0
C	0.06	88	174	3.1	772.5	772.5	772.5	0.0
D	0.08	43	116	4.7	772.8	772.8	772.8	0.0
E	0.10	77	163	3.3	774.5	774.5	774.5	0.0
F	0.15	35	120	4.5	776.7	776.7	776.7	0.0
G	0.17	180	349	1.5	777.2	777.2	777.2	0.0
H	0.19	157	500	1.1	777.3	777.3	777.3	0.0
I	0.22	80	257	2.1	777.3	777.3	777.3	0.0
J	0.23	35	120	4.5	777.3	777.3	777.3	0.0
K	0.26	57	174	3.0	778.6	778.6	778.6	0.0
L	0.29	118	122	4.2	778.7	778.7	778.7	0.0
M	0.33	143	229	2.3	780.5	780.5	780.5	0.0
N	0.38	74	174	3.0	781.9	781.9	781.9	0.0
O	0.40	100	242	2.1	784.1	784.1	784.1	0.0
P	0.44	182	366	1.4	784.3	784.3	784.3	0.0
Q	0.50	28	48	7.5	785.6	785.6	785.6	0.0
R	0.51	98	218	1.7	788.4	788.4	788.4	0.0
S	0.55	176	522	0.7	788.5	788.5	788.5	0.0
T	0.61	168	375	1.0	788.6	788.6	788.6	0.0
U	0.63	78	163	2.2	788.7	788.7	788.7	0.0
V	0.68	80	128	2.8	789.6	789.6	789.6	0.0
W	0.71	49	78	4.6	790.0	790.0	790.0	0.0
X	0.74	84	136	2.6	790.9	790.9	790.9	0.0
Y	0.75	85	140	2.6	791.0	791.0	791.0	0.0
Z	0.76	114	178	2.0	791.2	791.2	791.2	0.0

[1]MILES ABOVE MOUTH

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TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF HALES CORNERS, WI

(MILWAUKEE CO.)

FLOODWAY DATA

WEMP BRANCH

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
WHITNALL PARK CREEK								
A	1.27	458	887	2.0	734.3	734.3	734.3	0.0
B	1.32	296	546	3.3	736.3	736.3	736.3	0.0
C	1.39	198	393	4.6	740.2	740.2	740.2	0.0
D	1.50	202	499	3.6	745.9	745.9	745.9	0.0
E	1.56	199	454	4.0	748.8	748.8	748.8	0.0
F	1.67	200	446	4.0	752.5	752.5	752.5	0.0
G	1.70	59	222	8.1	754.3	754.3	754.3	0.0
H	1.74	113	565	3.2	759.8	759.8	759.8	0.0
I	1.76	153	938	1.9	762.6	762.6	762.6	0.0
J	1.81	200	1096	1.6	762.7	762.7	762.7	0.0
K	1.86	141	877	1.4	762.8	762.8	762.8	0.0
L	1.89	30	265	4.5	762.8	762.8	762.8	0.0
M	1.93	115	519	2.3	764.1	764.1	764.1	0.0
N	1.96	33	234	5.1	764.5	764.5	764.5	0.0
O	1.99	68	249	4.8	765.1	765.1	765.1	0.0
P	2.04	112	183	6.6	767.2	767.2	767.2	0.0
Q	2.10	254	193	4.1	768.9	768.9	768.9	0.0
R	2.16	128	170	4.6	772.0	772.0	772.0	0.0
S	2.25	273	503	1.6	775.1	775.1	775.1	0.0
T	2.30	165	199	3.7	775.9	775.9	775.9	0.0
U	2.35	162	197	3.7	777.7	777.7	777.7	0.0
V	2.42	43	123	6.0	779.0	779.0	779.0	0.0
W	2.45	32	114	6.5	780.0	780.0	780.0	0.0
X	2.54	29	96	4.7	782.4	782.4	782.4	0.0
Y	2.58	21	69	6.5	783.2	783.2	783.2	0.0
Z	2.66	84	116	3.8	786.4	786.4	786.4	0.0

[1]MILES ABOVE MOUTH

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TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF HALES CORNERS, WI

(MILWAUKEE CO.)

FLOODWAY DATA

WHITNALL PARK CREEK

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference Between 10- and 100-year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

Seven reaches meeting the above criteria were required for the flooding sources in the Village of Hales Corners. These included four reaches on Root River Tributary and one reach each on 113th Street Branch, WEMP Branch, and Upper Kelly Lake. The locations of the riverine reaches are shown on the Flood Profiles (Exhibit 1).

5.2 Flood Hazard Factors

The Flood Hazard Factor (FHF) is the Federal Insurance Administration device used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their Flood Hazard Factors are used to set actuarial insurance premium rate tables based on Flood Hazard Factors from 005 to 200.

The Flood Hazard Factor for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest one-half foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the Flood Hazard Factor is 005; if the difference is 1.4 feet, the Flood Hazard Factor is 015; if the difference is 5.0 feet, the Flood Hazard Factor is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the Flood Hazard Factor is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective Flood Hazard Factors, the entire incorporated area of the Village of Hales Corners was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

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Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations shown or Flood Hazard Factors determined.
Zones A1, A2, A4, A9:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to Flood Hazard Factor.
Zone B:	Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; or areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

Table 4, "Flood Insurance Zone Data," summarizes the flood elevation differences, Flood Hazard Factors, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the Village of Hales Corners is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the Federal Insurance Administration.

6.0 OTHER STUDIES

A Comprehensive Plan for the Root River Watershed was prepared for the Southeastern Wisconsin Regional Planning Commission in 1966 by Harza Engineering Company (Reference 9). Although no flood profiles had been computed for streams in Hales Corners, some information on historic flooding in Hales Corners was included in this report.

A drainage-improvement study was made for the Village of Hales Corners in 1962 by H. C. Webster and Son, Consulting Engineers (Reference 10). Because the design storm used in that report was not based on a particular recurrence interval and because no profiles were computed, comparisons with this report were not possible.

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FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3] (FEET NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
WHITNALL PARK CREEK							
REACH 1	0001	-0.9	N/A	0.5	010	A2	VARIES – SEE MAP
REACH 2	0001	-4.4	N/A	2.4	045	A9	VARIES – SEE MAP
REACH 3	0001	-1.2	N/A	0.9	010	A2	VARIES – SEE MAP
REACH 4	0001	-1.8	N/A	1.8	020	A4	VARIES – SEE MAP
WEMP BRANCH							
REACH 1	0001	-0.6	-0.2	0.4	005	A1	VARIES – SEE MAP
113TH STREET BRANCH							
REACH 1	0001	-0.4	-0.1	0.2	005	A1	VARIES – SEE MAP
UPPER KELLY LAKE							
REACH 1	0001	-1.1	-0.8	0.9	010	A2	809

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT

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TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF HALES CORNERS, WI
(MILWAUKEE CO.)

FLOOD INSURANCE ZONE DATA

WHITNALL PARK CREEK—WEMP BRANCH
113TH STREET BRANCH - UPPER KELLY LAKE

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This report either supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for the purposes of the National Flood Insurance Program.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic and other pertinent data used in this study can be obtained by contacting the office of the Federal Insurance Administration, Regional Director, One Dearborn Street, Chicago, Illinois 60602.

8.0 REFERENCES AND BIBLIOGRAPHY

1. U.S. Department of Commence, Weather Bureau, Wisconsin Climatological Data: 1961.

2. U.S. Department of Agriculture, Soil Conservation Service, Engineering Division, Technical Release No. 55, Urban Hydrology for Small Watersheds, 1975.

3. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Wauwatosa, Wisconsin, (in progress).

4. Wisconsin Department of Natural Resources, written communication, 1976.

5. Aero-Metric Engineering, Inc., Topographic Maps, Scale 1:1200, Contour Interval two feet: Hales Corners, Wisconsin, 1976.

6. U. S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water-Surface Profiles, Generalized Computer Program, 1973.

7. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Village of Hales Corners, Wisconsin, May 1974, (revised) November 1976.

8. Wisconsin Department of Natural Resources, Publication No. 3-880 (75), Natural Resources Use Controls and Assistance, 1975.

9. Southeastern Wisconsin Regional Planning Commission, Planning Report No. 9, A Comprehensive Plan for the Root River Watershed, Harza Engineering Company, 1966.

10. Village of Hales Corners, Drainage Study of a Part of the Northwest Quadrant of the Village of Hales Corners, H. C. Webster and Son, Consulting Engineers, 1962.

9.0 REVISIONS DISCRIPTION

This section has been added to provide information regarding significant revisions made since the original Flood Insurance Study was printed. Future revisions may be made that do not result in the republishing of the Flood Insurance Study report. To assure that any user is aware of all revisions, it is advisable to contact the community repository of flood hazard data located at the Village Commissioner's Office, 5635 New Berlin Road, Hales Corners, Wisconsin.

9.1 First Revision (Revised June 15, 1988)

a. Acknowledgments

The hydrologic and hydraulic analyses for this Revisions Description were obtained from the Southeastern Wisconsin Regional Planning Commission (SEWRPC), Community Assistance Planning Report No. 121, "A Stormwater Management Plan for the Village of Hales Corners, Milwaukee County, Wisconsin" (Reference 11). The Federal Emergency Management Agency (FEMA) reviewed and accepted these data for purposes of this revision.

b. Scope

The stream previously labeled Root River Tributary has been relabeled to Whitnall Park Creek. Detailed flooding information along Whitnall Park Creek was revised from approximately 550 feet upstream of West Forest Home Avenue to Upper Kelly Lake.

c. Hydrologic and Hydraulic Analyses

SEWRPC used the Illinois Urban Drainage Area Simulator (ILLUDAS) hydrologic-hydraulic simulation model to develop the data for this revision. The ILLUDAS model was used to simulate the 10- and 100-year recurrence interval flood discharges under existing, 1980, land use conditions and existing, 1980, channel conditions (Reference 11). Peak discharges for the 10- and 100-year floods for Whitnall Park Creek are shown in Table 5, Revised Summary of Discharges. Because revised 500-year recurrence interval flood discharges were not computed for this reanalysis, 500-year flood discharges from the analysis used for the previous Flood Insurance Study for the Village of Hales Corners, Milwaukee County, Wisconsin (Reference 12), are shown in Table 5.

The resulting 10- and 100-year flood discharges were then used in a uniform flow channel hydraulic model and a culvert hydraulic model to determine flood profiles (Reference 11). Where complex and nonuniform conditions existed, the resulting 10- and 100-year flood discharges were then used in the U.S. Army Corps of Engineers HEC-2 hydraulic backwater model to determine flood profiles (Reference 13).

TABLE 5 - REVISED SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
WHITNALL PARK CREEK					
at west Forest Home Avenue	N/A	546	N/A	116	1,660
just upstream from confluence with Wemp branch	2.25	395	N/A	793	970
just upstream of south Kurtz Road	N/A	120	N/A	231	630

The 100-year flood profile was drawn based on the hydraulic analysis. The 10-year flood profile was approximated based on the computed 100-year flood profile and the previous hydraulic analysis. The 500-year flood profile was reproduced from the previous Flood Insurance Study for the Village of Hales Corners (Reference 12). No 50-year flood frequency was determined because this frequency flood is not essential to the flood hazard factor determination or zone determination. Flood elevations on Upper Kelly Lake without wave or runup heights have been revised for the selected recurrence intervals and are shown in Table 6, Revised Summary of Elevations.

TABLE 6 - REVISED SUMMARY OF ELEVATIONS

FLOODING SOURCE AND LOCATION	ELEVATION (NGVD) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
UPPER KELLY LAKE				
along entire shoreline	807.4	N/A	809.2	811.9

d. Floodways

A 100-year floodway hydraulic analysis for Whitnall Park Creek was not computed for this revision. Therefore, the 100-year flood hydraulic analysis was used as the floodway analysis for Whitnall Park Creek. The results of this analysis were tabulated at selected cross sections and are presented in Table 3, Floodway Data.

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e. Other Studies

A Flood Insurance Study revision is in progress for the City of New Berlin, Wisconsin (Reference 14) and is in agreement with this revision.

f. References and Bibliography

11. Southeastern Wisconsin Regional Planning Commission, Community Assistance Planning Report No. 121, A Stormwater Management Plan for the Village of Hales Corners, Milwaukee County, Wisconsin, March 1986.

12. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Village of Hales Corners, Milwaukee County, Wisconsin, June 1979.

13. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water-Surface Profiles, Generalized Computer Program, Davis, California, April 1984.

14. Federal Emergency Management Agency, Flood Insurance Study, City of New Berlin, Waukesha County, Wisconsin, March 1987, revision in progress.

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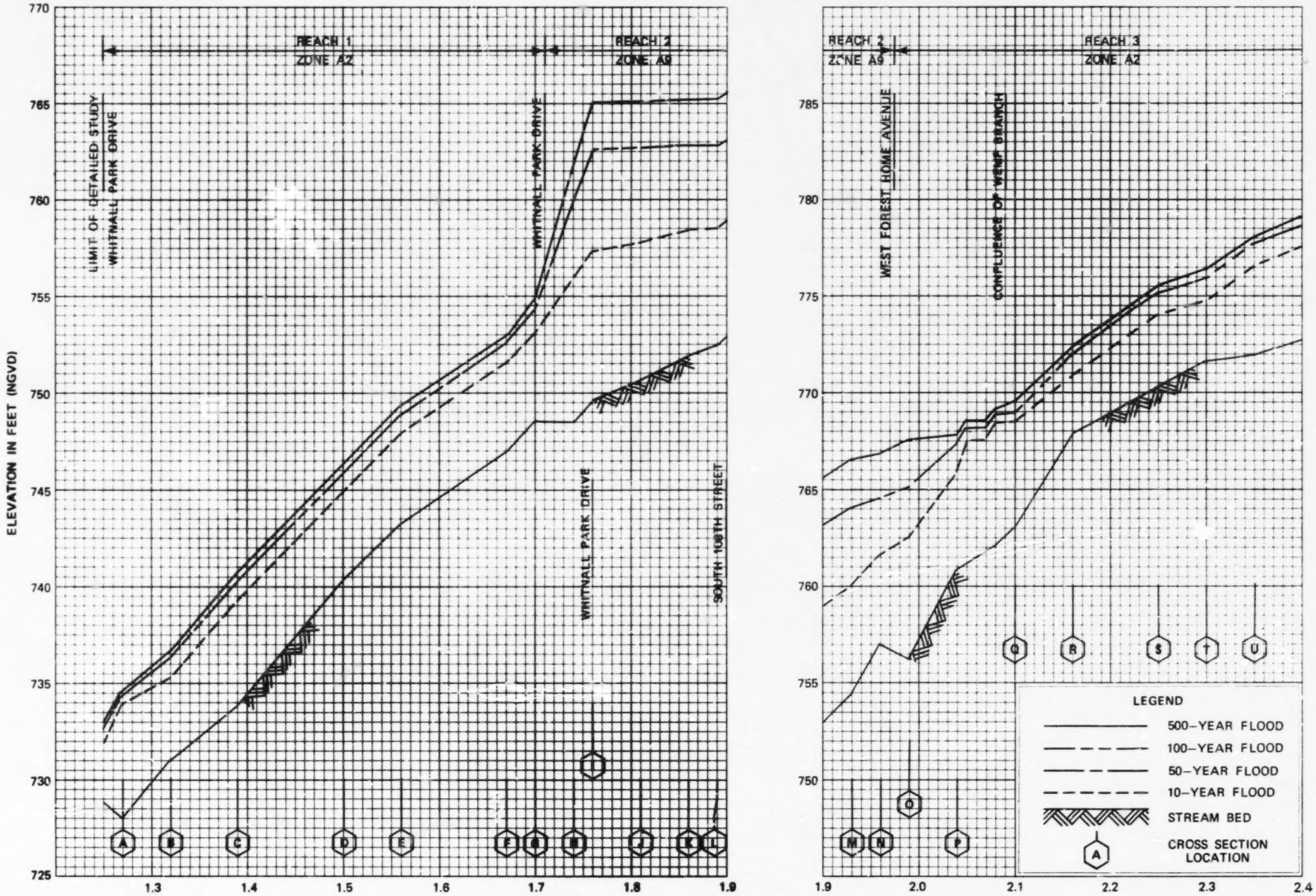

STREAM DISTANCE IN MILES ABOVE MOUTH

FLOOD PROFILES

WHITNALL PARK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF HALES CORNERS, WI
(MILWAUKEE CO.)

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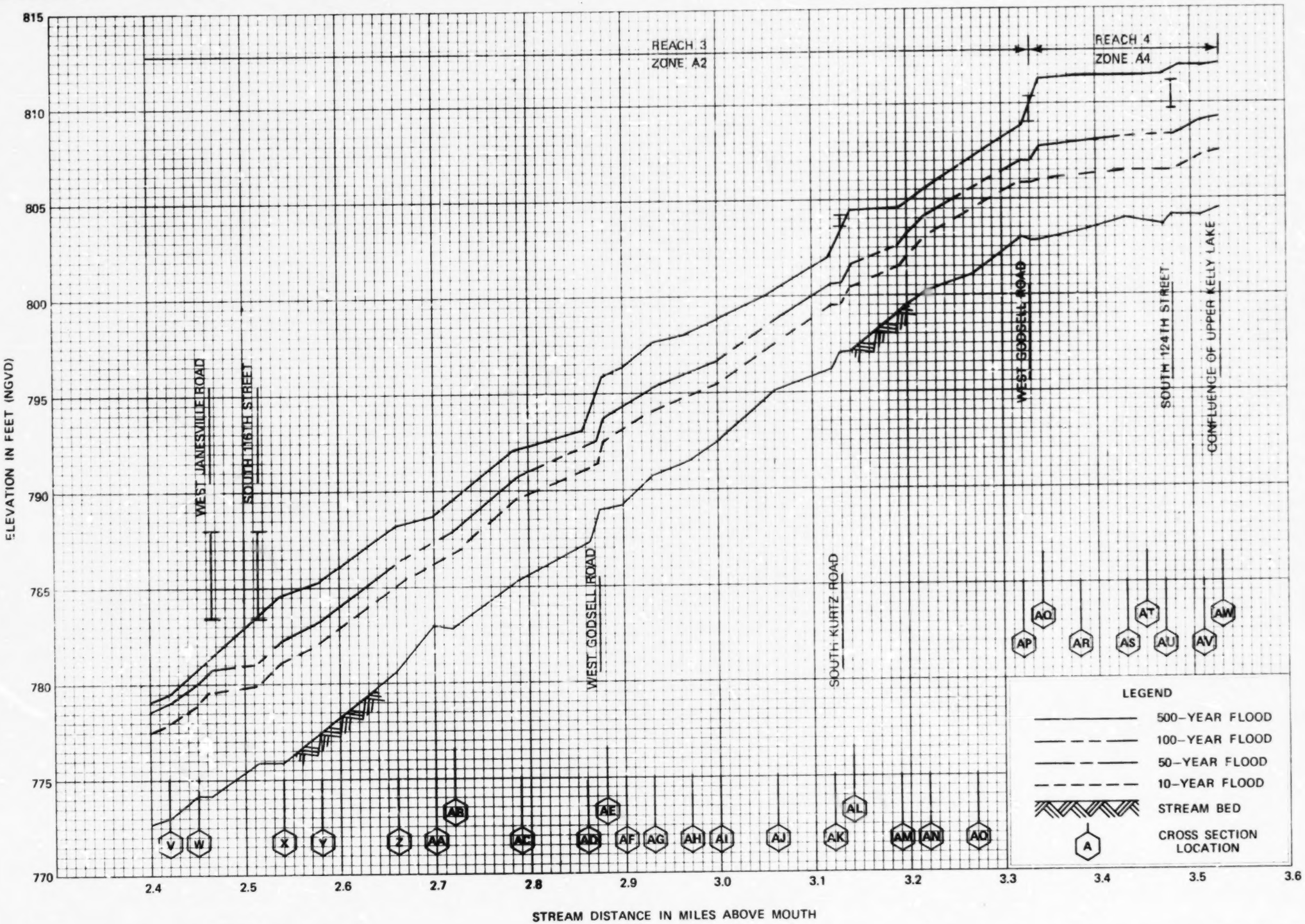

FLOOD PROFILES

WHITNALL PARK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF HALES CORNERS, WI
(MILWAUKEE CO.)

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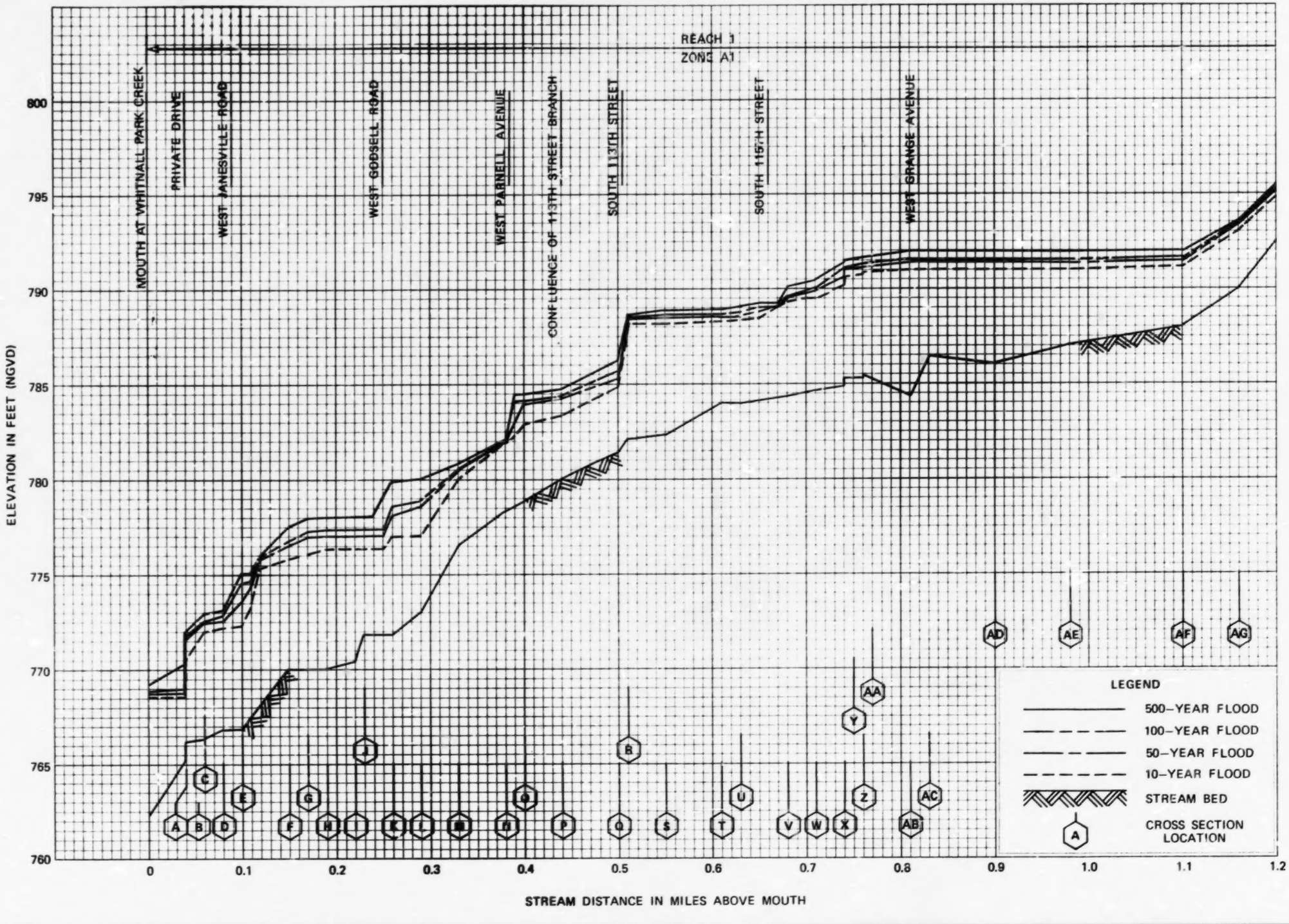

FLOOD PROFILES

WEMP BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF HALES CORNERS, WI
(MILWAUKEE CO.)

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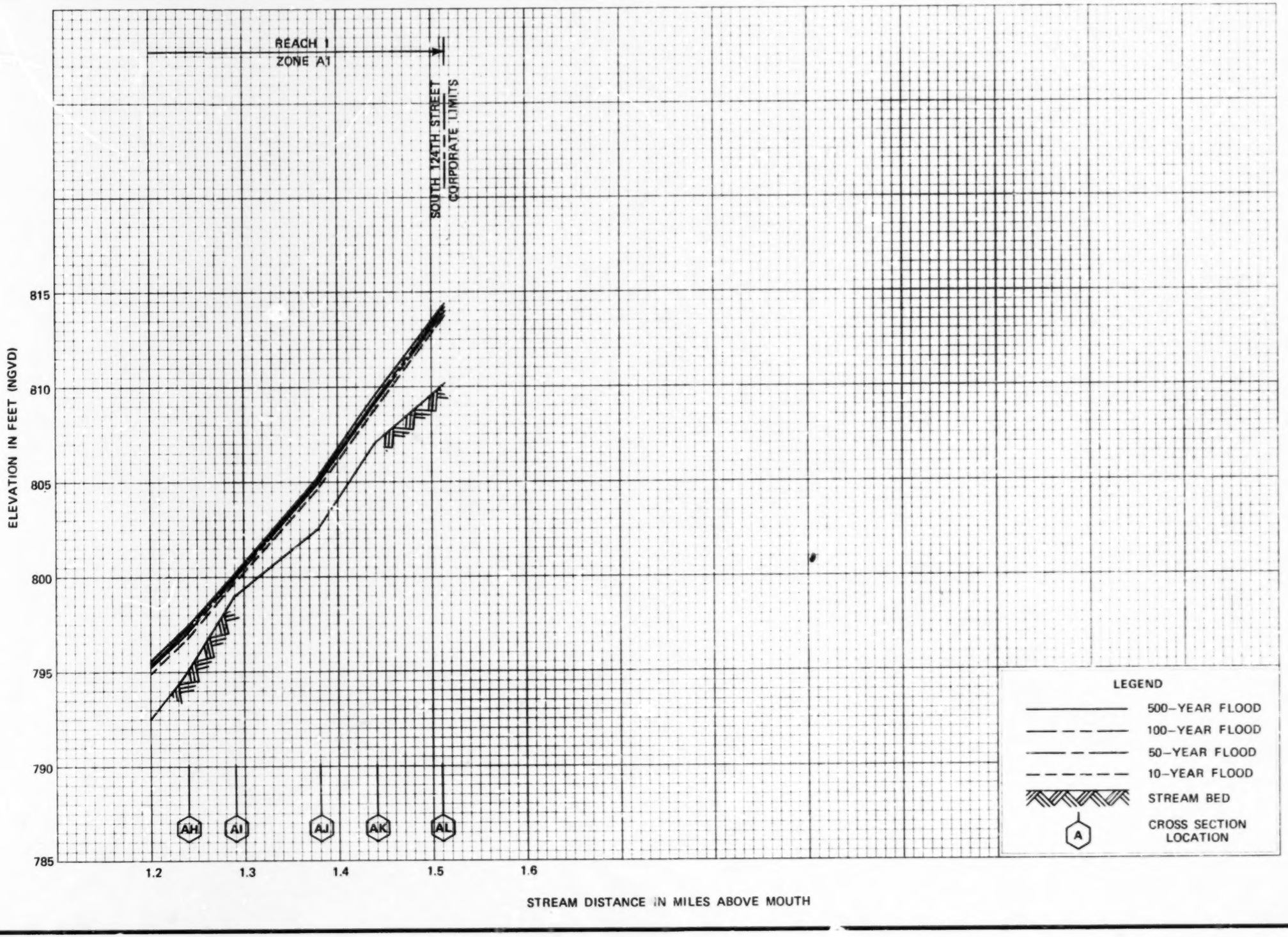

FLOOD PROFILES

WEMP BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF HALES CORNERS, WI
(MILWAUKEE CO.)

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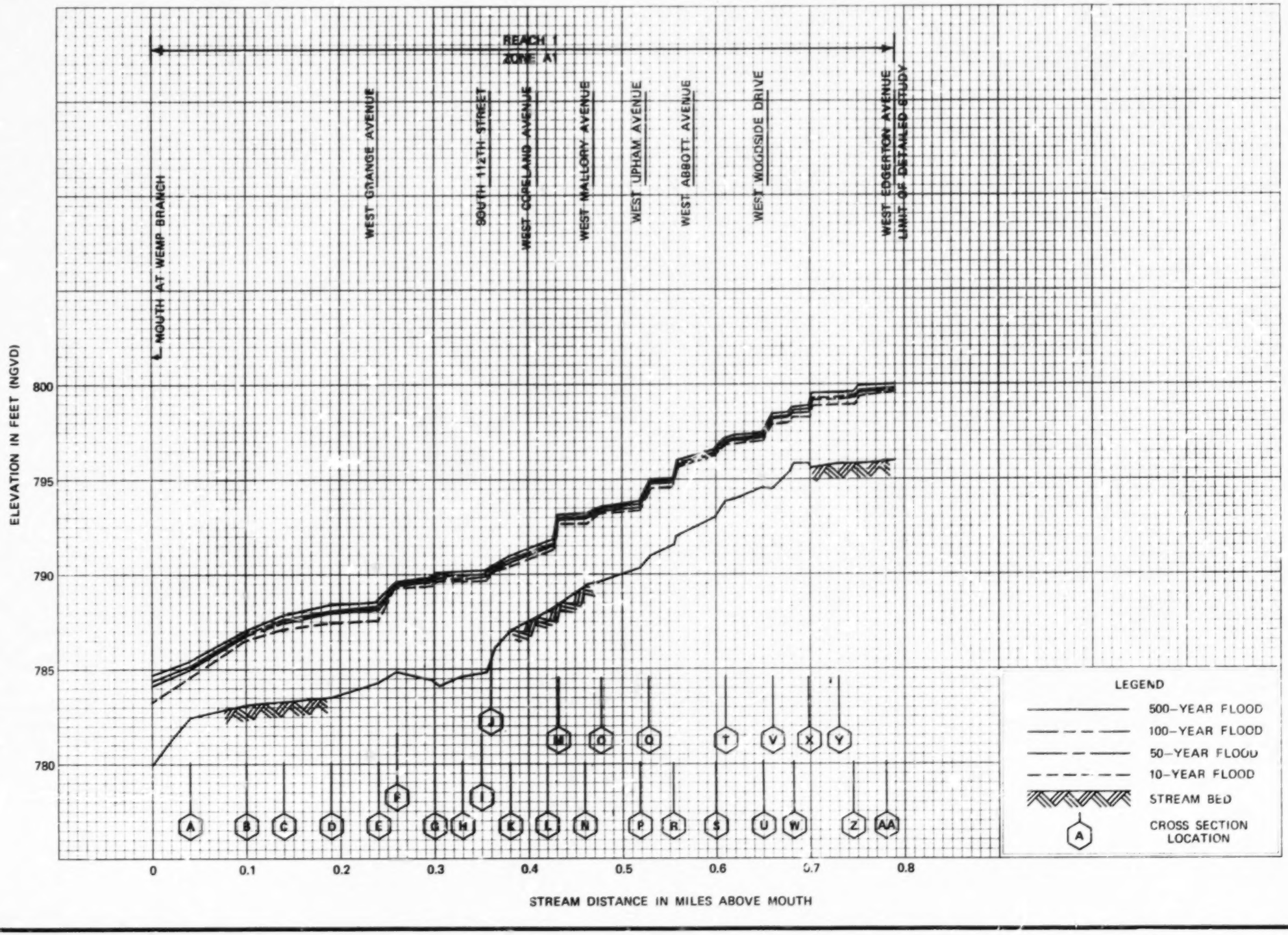

FLOOD PROFILES

113TH STREET BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF HALES CORNERS, WI
(MILWAUKEE CO.)

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